PSYCHE

A JOURNAL OF ENTOMOLOGY

ESTABLISHED IN 1874

VOL. XXVII OCTOBER, 1920 NUMBER 5

Prodryas persephone Scudder.

CONTENTS

Synopsis of the Dipterous Family Psilidæ. *A. L. Melander* 91
On Certain Species of Haltica, Old and New. *H. C. Fall* 101
Descriptions of Some New Tropical Pachygastrinæ. *C. W. Johnston* . . . 112
Notes on the Lines of Descent of Lower Winged Insects. *G. C. Crampton* . . 116
Proceedings of the Cambridge Entomological Club 127
Book Review 129
Exchange Column 130

CAMBRIDGE ENTOMOLOGICAL CLUB.

OFFICERS FOR 1920.

President . . . . . C. A. Frost.
Vice-President . . . . . W. L. W. Field.
Secretary . . . . . J. C. Emerton.
Treasurer . . . . . F. H. Walker.

Executive Committee
S. W. Denton, L. W. Swett, P. G. Bolster.

EDITORIAL BOARD OF PSYCHE.

EDITOR-IN-CHIEF.
C. T. Brues, Harvard University.

ASSOCIATE EDITORS.

C. W. Johnson,
Boston Society of Natural History.

V. L. Kellogg,
Stanford University.

A. L. Melander,
Washington State College.

A. P. Morse,
Wellesley College.

J. H. Emerton,
Boston, Mass.

J. G. Needham,
Cornell University.

W. M. Wheeler,
Harvard University.

Psyche is published bi-monthly, the issues appearing in February, April, June, August, October and December. Subscription price, per year, payable in advance: $2.00 to subscribers in the United States, Canada or Mexico; foreign postage 15 cents extra. Single copies, 40 cents.

Cheques and remittances should be addressed to Treasurer, Cambridge Entomological Club, Bussey Institution, Forest Hills, Boston 30, Mass.

Orders for back volumes, missing numbers, notices of change of address, etc., should be sent to Cambridge Entomological Club, Bussey Institution, Forest Hills, Boston 30, Mass.

IMPORTANT NOTICE TO CONTRIBUTORS.

Manuscripts intended for publication, books intended for review, and other editorial matter should be addressed to Professor C. T. Brues, Bussey Institution, Forest Hills, Boston 30, Mass.

Authors contributing articles over 8 printed pages in length will be required to bear a part of the extra expense for additional pages. This expense will be that of typesetting only, which is about $1.20 per page. The actual cost of preparing cuts for all illustrations must be borne by contributors: the expense for full page plates from line drawings is approximately $3.60 each, and for full page half-tones $4.80 each, smaller sizes in proportion.

AUTHOR'S SEPARATES.

Reprints of articles may be secured by authors at the following rates:

Length of Article.	50 Copies, without cover.	50 Copies, with cover.	100 Copies, without cover.	100 Copies, with cover.
1 to 4 pages	$3.75	$8.75	$5.00	$9.00
5 to 8 pages	8.75	13.75	11.60	15.60
9 to 12 pages	10.63	15.63	14.10	18.00
13 to 16 pages	11.90	16.90	15.80	19.80
17 to 32 pages	22.50	27.50	35.00	39.00

Offprints, if occurring in one signature, per 100, $2.50; if in two signatures, $4.50.

Entered as second-class mail matter at the Post Office at Boston, Mass. Acceptance for mailing at special rate of postage provided for in section 1103, Act of October 3, 1917, authorized on June 29, 1918.

PSYCHE

VOL. XXVII OCTOBER, 1920 No. 5

SYNOPSIS OF THE DIPTEROUS FAMILY PSILIDÆ.[1]

By A. L. Melander,
Pullman, Washington.

The following keys are given to assist in the determination of the flies of the family Psilidæ as at present known from North America. The study is based entirely on my own collection, species before me being indicated by starring the localities represented. In the February (1920) issue of Psyche Mr. Charles W. Johnson gives tables of *Loxocera* and a new genus, *Pseudopsila*. With slight modifications these tables are incorporated in the present paper.

Table of Genera.

1. Antennæ greatly lengthened, longer than the head, the third joint very slender, more than four times the length of the second joint and distinctly longer than the arista; no fronto-orbital or postvertical bristles. . . *Loxocera* Meigen

   Antennæ shorter, the arista longer than the third joint 2

2. Third antennal joint subcylindrical, about three times as long as the second; no fronto-orbitals, but postverticals present, one presutural dorsocentral present . . . *Pseudopsila* Johnson

   Third antennal joint short, ovate, rounded 3

3. Face very strongly retreating; anal cell as long as second basal . . . . . *Psila* Meigen

   Face more nearly perpendicular, the head not triangular in profile 4

4. Robust; occiput flat, ocellar triangle small and placed well back; 4 scutellar bristles; pteropleuræ bare; first vein ending opposite anterior crossvein, second vein near wing-tip, anal cell shorter than second basal and truncate *Chyliza* Fallen

   Slender; head spherical, ocellar triangle placed forward; 2 scutellar bristles; pteropleuræ with hairs; first vein ending before anterior crossvein, second vein about midway

[1] Contribution from the Zoölogy Laboratory of the State College of Washington.

between posterior crossvein and wing-tip, anal cell almos
equalling second basal and with rounded apex
Strongylophthalmyia Helle

Loxocera Meigen

Eyes large, in profile attaining the front margin of the head
with the occiput one-tenth and the cheeks one-third the
greatest diameter .....
Eyes small, nearly round, not reaching the front of the head
the occiput one-third and the cheeks fully as wide as their
greatest diameter. (Wash.*) ..... *microps*, sp. nov
2. Wings hyaline with the tip and posterior crossvein clouded
(*cylindrica* Say) .....
Wings uniformly brownish hyaline .....
3. Anterior margin of the thorax, a dorsal line, humeri, and lateral
lines, black. (N. H., Vt., Mass., Pa., Ill.,* Minn., Kans.
var. *cylindrica* Say
Anterior margin very broad, covering at least one-third of the
thorax, a dorsal line, short lateral lines and about one-third
of the anterior of the pleura, black. (Me., N. H., Vt.,
Quebec,* Mass.,* Conn., N. Y.,* N. J., Mich., Kans.)
var. *pleuritica* Loew
Dorsal line, humeri, lateral margins and the upper half of the
pleura, black (N. H., Vt., Mass., Pa., D. C., Va.)
var. *pectoralis* Loew
Dorsal and lateral lines (sometimes obsolete) and a spot above
the yellow humeri, black. (Vt., Mass., Conn., N. J., Pa.,
D. C.,* Va., N. C., La.,* Tex.*) ... var. *obsoleta* Johnson
4. Anterior third of the thorax black, dorsal and lateral lines
wanting; abdomen, except the sides of the first segment,
black. (Me., Mass.,* Conn., N. H., N. J., Va., Wis.,
Mont.,* Idaho,* Wash., Ore.) ..... *collaris* Loew
Anterior and lateral margins and a dorsal line on the thorax,
black; abdomen except at the base red. (Kans., Tex.,
Colo.*) ..... *fumipennis* Coquillett

Loxocera microps sp. nov.

Male. Length, 5 mm. Polished testaceous variegated with black. Head testaceous with a median frontal black stripe, ante-

rior orbits blackish; frontal triangle attaining suture and occupying half of the front at the ocelli; face greatly receding, antennal grooves white-velvety, center stripe wide and polished; eyes small, nearly round, not reaching front margin of profile by one-fifth their greatest diameter and the hind margin by about one-third, facets uniform, cheeks deeper than eye, orbits distinctly sunken; occiput flat, swollen in back of the cheeks, with fine yellow hairs; palpi tipped with brown; antennæ greatly lengthened, basal joints small, third joint twenty times as long as the second, arista yellow, the thickened basal part with brown tip, pubescence microscopic. Thorax testaceous, notum centrally broadly black in front, vestiture pale yellow, bristles weak and black, one dorsocentral and one pair scutellars; metanotum centrally blackened; mesopleuræ with white hairs below. Abdomen piceous, sides toward the base yellowish; genitalia minute. Legs yellowish. Halteres pale yellow. Wings nearly hyaline with a brownish tinge, veins firm and brown, sections of fourth vein proportioned 2: 5: 4, third and fourth veins apically parallel.

Two specimens. Paradise Valley, Mount Rainier, Wash., August, 1917.

Pseudopsila Johnson.

Thorax entirely black (N. H., Mass., N. Y., Can.). . . *fallax* Loew
Thorax yellow, marked with black 2
2. Dorsum without lateral margins of black 3
Dorsum with lateral margins of black 4
3. Humeri and upper half of pleuræ black (Vt., N. Y.) (Proc. Acad. Nat. Sci. Phil., 1919, 193) (*Psila*) . . *angustata* Cresson
Anterior margin, pleuræ, metanotum and a narrow dorsal line black. (Me., N. H.) (Psyche, 1920, 18) . . *perpolita* Johnson
4. With broad lateral margins only, upper half of pleuræ black. (Conn., Me., N. J., Pa., Quebec) (*Psila*) . . . *bivittata* Loew
With a broad anterior and lateral margins, upper half of pleuræ black. (N. H., Mass., Conn., Va.) (*Psila*) . . . *collaris* Loew

Psila Meigen.

Mesonotum and pleuræ entirely yellow 2
Thorax more or less black; abdomen wholly black 5

2. Entire insect yellow, except the black frontal or ocellar triangle; arista, and cephalic and thoracic bristles black. 3
Head and thorax yellow, abdomen wholly black; arista and bristles yellow, the arista short-pubescent; tip of palpi black (*bicolor* Meigen) 4

3. Frontal triangle large, black, polished; arista, pubescent; antennæ half as long as the face. (N. H.)
frontalis Coquillett
Only ocellar triangle black; arista bare; antennæ distinctly less than half the facial length. (Ore.) . . *microcera*, sp. nov.

4. Metanotum wholly yellow (Europe, N. H., Can., Mont.,* Wyo.,* Wash., Alaska) . . . . . var. *bicolor* Meigen
Metanotum centrally black (Can., Colo.,* Wyo.)
var. *dimidiata* Loew

5. Mesonotum yellow the humeri alone black; only upper pleuræ black; bristles of head and thorax black; third antennal joint dark 6
Mesonotum centrally black 7

6. Head entirely yellow except the small ocellar spot; palpi yellow (Tex.*) . . . . . *colorata*, sp. nov.
Occiput bimaculate; palpi black (N. J., D. C., Wis.)
lateralis Loew

7. Bristles of head and thorax black; legs mostly black; antennæ, the nearly bare arista, and the palpi black; head and sternopleuræ black 8
Bristles of head and thorax yellowish; coxæ and legs yellow; arista yellowish; head yellowish 9

8. Base of arista thick; last section of fourth vein arched and shorter than the penultimate section. (Wash.*)
washingtona sp. nov.
Arista not thickened; last two sections of fourth vein equal; face greatly receding; two dorsocentrals. (Idaho*)
atrata, sp. nov.

9. Sternopleuræ black; at least tip of palpi blackened; third antennal joint mostly or wholly yellow 10
Sternopleurae black; palpi and antennæ yellow; mesonotum with short white pilosity (Mex.) . . . . . *exigua* Wulp
Sternopleuræ yellow; palpi wholly yellow; third antennal joint black. (N. Y.,* N. J.,* Ill.,* Wis.) . . . . . *sternalis* Loew

10. Palpi wholly black; third antennal joint round, wholly yellow (eastern) or upper edge dark (western); frontal triangle black. (N. H., Alaska*) ..... *levis* Loew
Palpi with black tip; third antennal joint oval, tipped with black; only ocellar spot black. (Europe*; Can., N. Y., Colo., Wash.*) ..... *rosæ* Fabricius

Psila microcera sp. nov.

Male. Length, 4 mm. Entirely yellow except for the black ocellar prominence and the black upper edge of the third antennal joint. Frontal triangle almost reaching the suture, periorbits distinct, one fronto-orbital, postverticals diverging and long, cephalic bristles black; antennæ short, third joint rounded, slightly longer than deep, arista bare and black. Eyes nearly round, equal to the longest diameter of the cheek. Thoracic bristles black, strong, two notopleural, one supra-alar, one dorsocentral, two scutellars. Wings hyaline, with a yellowish tinge, veins yellow, sections of the fourth vein proportioned 2 : 7 : 5, of the fifth vein 12 : 1, posterior crossvein transverse.

A single specimen collected by Professor A. L. Lovett at Duffy Prairie, Ore., July 26, 1915, and presented by F. R. Cole. Three females collected by R. C. Shannon at Sprague, Ewan and Medical Lake, Wash.* The last mentioned specimen has the bristles yellow.

Psila colorata sp. nov.

Male. Length, 4 mm. Head yellow, a small black spot between the ocelli; lower occiput swollen; third antennal joint twice as long as deep, black beyond the arista, which is yellow, and white-pilose; mouthparts yellow; cephalic bristles long and black, no fronto-orbitals. Mesonotum, scutellum, center of metanotum, and lower pleuræ yellow, humeri, mesopleuræ, pteropleuræ and sides of metanotum black, prothoracic spiracle yellow; thoracic bristles black, hairs yellow, one dorsocentral, pleural hairs sparse. Abdomen black. Legs wholly pale yellow, apical spurs small and yellow. Halteres whitish; calypteres luteous, the fringe blackish. Wings with yellow tinge becoming brownish apically, veins luteous, the third vein becoming brown, sections of fourth vein proportioned 1 : 1 : 2 : 2.1, the last section slightly arched, posterior

crossvein transverse, curved, twice as long as the last section of the fifth vein.

One specimen. Austin, Tex., April 20, 1900.

Psila washingtona sp. nov.

Female. Length, 4 mm. Head, thorax and abdomen entirely shining jet black, the fine pubescence pale. Face one-third longer than the front; cephalic bristles black, two minute fronto-orbitals; antennæ black, the third joint bluntly triangular, one-half longer than wide, the arista black, thick at the base then subulate, its pubescence very short; mouthparts black. Thoracic bristles black, two dorsocentrals, pleural hairs not abundant. Legs mostly blackish, coxæ jet black, the knees, front tibiæ, tips of posterior tibiæ and the tarsi brown. Halteres yellow. Wings with uniform yellow tinge, veins yellow, sections of fourth vein proportioned 1 : 1 : 2 : 0.8, the last section arched, posterior crossvein nearly transversely located, more than twice as long as the last section of fifth vein.

One specimen. Mount Constitution, Orcas Island, Wash., July 17, 1909.

The species comes nearest the European *P. nigra* Fallen, which usually has from two to four dorsocentrals, one to three fronto-orbitals and the last section of the fifth vein more than half the length of the posterior crossvein; its arista is not thickened basally. *P. morio* Zetterstedt is also similar, but has two distinct fronto-orbitals, four dorsocentrals, black tarsi and the anterior crossvein more basally located. *P. atra* Meigen has a more pubescent arista, two fronto-orbitals and four dorsocentrals well developed.

Psila atrata sp. nov.

Length, 3 mm. Head, thorax and abdomen entirely shining black, the fine pubescence yellow. Head conical, the face very greatly receding and nearly half longer than the front; cephalic bristles black, one minute fronto-orbital; antennæ blackish, the third joint elliptical, the arista blackish, not greatly thickened at base, its brown pubescence short but obvious; mouthparts black. Thoracic bristles black, two dorsocentrals, pleural hairs sparse. Coxæ black, femora blackish, knees narrowly brown, anterior tibiæ and all tarsi brown, hind tibiæ broadly blackish along the

middle. Halteres yellow. Wings with uniform slight yellow tinge, veins pale yellow, sections of fourth vein proportioned 1 : 1 : 2 : 2, the last section only slightly curved, posterior cross-vein nearly transverse, equal to the last section of fifth vein.

Twenty specimens. Type from Boville, Idaho, June 18, 1911; paratypes from same place (Melander), Troy (W. M. Mann) and Vollmer (J. M. Aldrich), all in Idaho; and Hood River, Ore. (F. R. Cole).

Chyliza Fallen

Dorsum of thorax yellow 2
Dorsum of thorax mostly black, the humeri and scutellum usually red 5
2. Pleuræ more or less yellow 3
Pleuræ and pectus black, a quadrangular black prealar spot; abdomen black; all femora with apical black ring; palpi reddish (Mex.) . . . . . *enthea* Giglio-Tos
3. Pleuræ entirely yellow; wings hyaline (Fla.) . . . *similis* Johnson
Upper half of pleuræ with black vitta; apex of wings clouded 4
4. Apical cloud of wings following the margin, not widened behind, veins two, three and four ending in the cloud; pleuræ marked with only the vitta. (N. J., Pa., D. C., Kans.,* Colo., La., Mex.) (*Tetradiscus pictus* Bigot) . *apicalis* Loew
Apical cloud widening behind, apex of veins two, three and four not clouded. (Mex.) (*Tetradiscus notatus* Bigot, not *Chyliza notata* Loew) . . . . . *bigoti*, nom. nov.
5. Front and hind femora blue-black but brownish at base, front tarsi black; palpi red; wings hyaline; thorax dark green, shining. (Can.) . . . . . *metallica* Walker
Femora black except tips, tarsi yellow; palpi black; wings smoky; body black. (Ore.*) . . . . . *leguminicola* sp. nov.
Femora largely yellowish, sometimes with subapical dark ring 6
6. At least hind femora with well marked subapical black or brown band; wings with apical clouding, second and third sections of costa as three to one 7
Femora yellow, at most reddish apically; wings not clouded apically, second and third sections of costa of *robusta* proportioned two to one 11

7. Femoral bands present on all legs; palpi brown (Europe; Mass., det. Hough) ..... *annulipes* Macquart
   Femoral bands weak or wanting on front and middle legs 8
8. Vertex narrower than depth of eye; head largely yellow, punctured; halteres yellow 9
   Vertex much broader than depth of eye; head black except narrow stripe on lower occipital orbits, deeply pitted; halteres black. (Wash.,* Ore.) ..... *scrobiculata* sp. nov.
9. Palpi entirely black 10
   Palpi tipped with black; anterior femora apically dark; sides of thorax more or less yellow; first posterior cell basally shaded. (Mex.) ..... *varipes* Wulp
10. Head, humeri, scutellum, posterior sides of mesonotum and at least sterno-mesopleural suture yellow. (N. H., D. C., N. J., Idaho.,* Wash.*) ..... *notata* Loew
    Thorax entirely black, except a reddish scutellar spot, occiput and frontal orbits mostly black. (Mass.*) .. *erudita* sp. nov.
11. Black; antennæ, broad apices of femora, tibiæ and scutellum reddish; marginal cell dark gray, costal cell brownish. (Nev.) ..... *robusta* Coquillett
    Blackish-green; antennæ black; legs yellowish; wings hyaline. ("U. S.") ..... *nigroviridis* Walker

Chyliza scrobiculata sp. nov.

Female. Length, 6 mm. Robust, deeply and closely punctured, with short dense woolly pale pubescence and short black bristles. Head large, eyes oblique, lower occiput deep, upper occiput flat, head coarsely punctured except the face and the shining vertical triangle which reaches half way to the antennæ, front opaque except the periorbital stripes; head black except for an orbital yellow stripe on lower occiput and a small orbital spot just below the antennal level; antennæ black above, yellow below, the third joint thumb-shaped, half longer than broad, arista brown on basal third, apically white; palpi broad, hairy and black. Thorax entirely black except the outer part of the scutellum, metathoracic callosities strong. Abdomen depressed, densely pubescent. Legs including the coxæ reddish yellow, the hind femora with a subapical incomplete black annulus. Halteres black. Wings smoky blackish throughout, darkest along the costa and at the tip, second

costal section three times the third, first vein ending near middle of the wing, third and fourth veins parallel.

Two specimens. Spokane, Wash., 30 August (Melander); Whitman National Forest, Ore., July (W. J. Chamberlin) in the collection of F. R. Cole.

Chyliza leguminicola sp. nov.

Length, 4–7 mm. Black, the anterior part of the front, the immaculate face, cheeks, occipital orbits, antennæ and scutellar margin luteous, the extremities of the femora, the tibiæ except distal half of hind pair, and the tarsi flavous, coxæ fuscous, halteres whitish. Front square, eyes large, palpi broad, frontal bristles black and inconspicuous, arista piceous, cephalic pubescence yellow. Thorax with strong piligerous punctures, the yellow hairs more or less whorled, bristles black, reduced in size and number to one pair each of supra-alar, intra-alar, dorsocentral and acrostichal, four scutellars. Abdomen sericeous with golden pubescence. Calypteres and fringe yellow, wings infumated, darker anteriorly, veins firm and black, costal sections proportioned 4 : 5 : 2, fourth vein 1.5 : 2 : 3, fifth vein 10 : 1, hind crossvein transverse.

Three specimens sent by L. P. Rockwood, who has swept this fly from the lupine, *Lupinus polyphyllus* Lindl., at Forest Grove, Ore., toward the end of April. He has also found puparia attached to the lower part of this plant during July, from which adults emerged the following March when wintered at room temperatures.

Chyliza erudita sp. nov.

Male. Length, 5 mm. Black, closely but not deeply punctured, the pale pubescence dense and appressed, bristles black. Head variegated black and yellow, the occiput black except the lower orbits, front subshining, centrally brownish, measuring in width seven-eighths the depth of the eye, frontal triangle narrow, reaching two-thirds the length of the front, two fronto-orbitals, face yellow, with two blackish subantennal spots, cheeks black except at the mouth-opening, mouthparts black, the palpi very broad; antennæ yellow, the upper edge darker, arista white and feathery pubescent. Thorax entirely black except the reddish tip of the scutellum. Legs including the coxae pale yellow, the hind femora with prominent black subapical ring. Halteres pale yellow.

Wings with costal half infumated, second and third sections of the costa proportioned 3 : 1, third and fourth veins parallel.

One specimen. Boston, Mass., May, 1914.

Strongylophthalmyia Heller

Heller, Wien. ent. Ztg. xxi, 226 (1902) *Strongylophthalmus* Hendel, Wien. ent. Ztg. xxi, 179–181 (1902).

One species occurs on the Pacific slope, having slender body and long legs suggestive of the Micropezidæ or the Cordyluridæ. The short antennæ and little receding face suggest *Chyliza*, but the slender, impunctate and nearly glabrous body and narrow wings are distinct from that genus. The vestigial, straight and evanescent auxiliary vein, distinct break in the costa before the end of the first vein, relatively long basal cells, absence of oral vibrissæ, slightly divergent postvertical bristles, pubescent arista, absence of distinct pleural bristles, and widely open first posterior cell indicate the family Psilidæ. From *Chyliza* the genus stands out in having the posterior cheeks not swollen, the center of the face neither sunken nor concave, the palpi slender, the pubescence of the notum and pleuræ not dense, appressed or parted in the female, the sides of the metathorax not calloused, the calypteres long-ciliate, the first vein shortened and the anal crossvein incurved. Hendel further characterized his genus as differing from *Chyliza* in having long ocellar and postvertical bristles, the latter located far behind the ocelli, mesopleuræ with distinct prealar bristle, only two strong scutellar bristles, with which chætotaxy the present species agrees. The pteropleural hairs are sparse.

Strongylophthalmyia angustipennis sp. nov.

Length, 3.5 to 5 mm. Head, thorax and abdomen polished black, impunctate, male with striking yellow pubescence, female with pubescence pale and sparse, bristles yellow. Head globose, the anterior part of the front, more extended in the male, the face, very narrow cheeks, and lower occipital orbits yellow, face short and narrow, half the length of the front; eyes large, lower facets larger than the upper ones; two fronto-orbital bristles, frontal triangle not polished; antennæ short, third joint orbicular, large and yellow in the male and brown and smaller in the female, arista brown, very briefly and closely pubescent; proboscis brownish,

palpi narrow, yellow in the male and brown in the female. Thorax slender, pectus yellowish, pleuræ nearly glabrous. Abdomen narrow, male genitalia with two small spoon-shaped end-valves and central short penis, female abdomen tapering. Legs including coxæ pale yellow, the tarsi a little brownish, apex of hind femora and middle of hind tibiæ usually dusky. Halteres pale yellow, calypteres yellow, with long fringe. Wings narrow, three times as long as wide, hyaline, veins brown, first vein ending at basal third of the wing, second and third sections of the costa proportioned 2 : 1, sections of fourth vein nearly 1 : 2: 3, the last section arching forward but apically becoming parallel with the third vein, anal vein extending two-thirds the distance to the margin, anal crossvein recurved at tip.

Twelve specimens. Type from Potlatch, on Hood's Canal, Wash., July 28, 1917; others from Blaine, Lynden and Auburn, Wash., and Lake Coeur d'Alene, Idaho, July to September. Several of the specimens were found on windows.

ON CERTAIN SPECIES OF HALTICA, OLD AND NEW.

By H. C. Fall,
Tyngsboro, Mass.

About a year ago, after reading the then recently published paper[1] by William Colcord Woods on the life histories of certain Maine Halticas previously regarded as varieties of *H. ignita* Illig., and having examined typical examples of all forms, kindly sent by Mr. Woods, some observations seemed pertinent to the writer, but the matter was allowed to go by default, and nothing was done beyond communicating one or two points to Mr. Woods by letter, chief of which, perhaps, was the fact that his *Haltica torquata* was not the *torquata* of Le Conte.

More recently comes Mr. Malloch's article,[2] in which he, too, alludes to the probable error in identifying the eastern blueberry flea beetle as Le Conte's *torquata*. Although Mr. Leng frankly admits his responsibility for the mistaken identification, he is by no means the first offender, as the *torquata* mix-up really dates back to Horn's Synopsis of the Halticini in 1889, in which he erroneously

[1] Maine Agric. Exp. Station Bull., 273; October, 1918.
[2] Bull. Brooklyn Ent. Soc. XIV, p. 123.

suppresses the name as a synonym of *carinata* Germ. As a matte of fact, in the series of *carinata* in the Horn collection the name labe *is* attached to a specimen of *torquata* bearing the locality labe "Bengtn Co., Vt." The type of *torquata* came from Santa Fé New Mexico (not from Kansas as Malloch says), and while I have seen scores of specimens from New Mexico, Arizona, Nevada and California, I have as yet to see an example from anywhere east of the type locality. Mr. Malloch has specimens from western Kansas which he believes to be the true *torquata*. If he is correct in his identification, this must I think, be the eastern limit of its range; but I strongly suspect his specimens are representatives of an unnamed species which is associated with *torquata* in collections and which will be described in the present article.

The accuracy of the "Vt." label on the Horn specimen may, therefore, be most seriously questioned, the more so, since this is only one of a number of species ranging from the seashore to the western deserts, which bear the impossible label "Bengtn Co., Vt." These all come from the same collector, who undoubtedly mixed material from various sources, and then, perhaps long after, carelessly attached the same locality label to the whole bunch. It therefore, behooves students of distribution to look with a very critical eye on this particular label before accepting it as genuine.

If, as all the available evidence seems to indicate, *torquata* does not occur east of the Rocky Mountains or vicinity, then it cannot be the *carinata* of Germar, which was described from Kentucky at so early a date that even accidental importation from the western plains or mountains is out of the question. Unfortunately Germar's description of *carinata* is too short and indefinite to be of much service, but it fits as well as any other the *carinata* of the Le Conte collection, which is also (and probably in consequence) the *carinata* at least in part of the most reliable modern collections, and of numerous bibliographical references. In the absence of any definite contradictory evidence this species should continue to bear the name *carinata*. It is not at all similar to *torquata*, but is closely related to *chalybea* and *ignita;* it is the *ulmi* of Woods.

In the Horn Collection specimens of this species are included both with *torquata* in his *carinata* series and with his *ignita* series. The former association is difficult to understand, as they do not at all closely resemble one another, but it explains two confusing

statements in his Synopsis. In the table of species *carinata* is characterized as having the ante-basal groove of the thorax moderately deep, evanescent at the extremities and never entire. In the remarks preceding the table of species he says that specimens of *carinata* occur with the impressed line as entire as in *chalybea*. The former statement, as well as the words "bright coppery red with bluish or purplish reflections," is evidently drawn from *torquata*, while the latter statement applies to the true *carinata*. Incidentally it may be remarked that the expressions, "ante-basal groove deep and entire" or "moderate and not entire," which look quite definite and satisfactory on the printed page, are really very difficult to apply in practice. Looked at from one position you unhesitatingly pronounce the groove entire, but viewed from a different angle you are quite as positive it isn't. The only course left to you is to try both roads, but this is no unusual thing in the use of taxonomic keys. But to come back to the *H. torquata* of Woods; if this is not the true *torquata*, what is it? Malloch has assumed it to be an undescribed species, and has proposed the name *sylvia*. This action I fear is premature. A specimen taken by myself at Tyngsboro, Mass., September 1, 1916, has been compared by me with Blatchley's type of *cuprascens* and proved so closely similar that I felt no hesitation in attaching that name to it. A Michigan example sent me by Dury, and others from Michigan, recently seen in the National Museum Collection are quite certainly the same thing, and I have little doubt are identical with Blatchley's type.

That very careful and painstaking work was done by Mr. Woods on the biologies of the Maine Halticas is obvious from a perusal of his report, which constitutes a valuable contribution to the recorded life histories of our coleoptera. The results of his work have thoroughly convinced him of the specific distinctness in all stages of three forms "that in Horn's Monograph would fall under the single species *ignita* Illig." To these he gave the names *corni*, *rosæ* and *ulmi*. As has been stated above, *ulmi* is to the best of our belief the *carinata* of Germar, so that two only are created at the expense of *ignita*. The writer has for some time inclined to the belief that the *ignita* complex would ultimately be broken up into a number of distinct species by more careful study coupled with an association with their food plants; he is, therefore, disposed to

accept the conclusions of Mr. Woods, at least until further evidence is forthcoming. On the other hand it must be conceded, that aside from color and size, which may mean much or very little, the differences as presented are all very small and not entirely constant. While a difference in food plant is always suggestive, it is of course by no means necessarily indicative of specific distinctness, the accompanying differences in color, etc., being quite conceivably no higher than racial in character. Mr. Woods' experiments show that the larvæ of all the forms studied could be induced to feed more or less readily on a considerable variety of plants. Apparently no effort was made to carry them through to maturity on any other than their preferred food plant, though the results of such effort, especially if successful, would have been of great interest, as would the results of attempts at cross breeding. Such experimentation is often difficult of accomplishment, and under the most favorable conditions involves skilled handling and a great deal of time. It is to be hoped however that Mr. Woods or some equally competent investigator may continue the work so well begun.

It should be noted that two statements in Woods' "Key to the Adults," on page 154, are more or less misleading. The antennæ of *ulmi* are said to be "one-half the length of the body." This certainly is not always true, since in one of the two typical examples sent me the antenna is extended along the side of the body in good position for comparative measurement and is quite three-fifths as long as the body. Again, the so-called "*ignita* of Chittenden" is said to have "segment 3 of the antennæ longer than segment 4." This is not true of any Haltica in our fauna, unless possibly as an accidental individual variation.

In this connection it becomes of interest to know just what the "*ignita* of Chittenden" is. Referring to his article on "The Strawberry Flea-Beetle"[1] it appears that so far as the beetle is described, it is the broadly conceived *ignita* of Horn's Synopsis, varying in color "from bright metallic golden, coppery, golden brown or purplish, to green and blue" and ranging in distribution from ocean to ocean and from Canada to Mexico. This does not help us any, but some observations made further on in the account of the life history as worked out by the author, supplemented by numerous specimens and some additional data kindly submitted to me by

[1] Some Insects Injurious to Garden Crops, Bull. 23 N. S. U. S. Dept. Agric. 1900.

Dr. Chittenden himself, show conclusively the species which may properly be called the "*ignita* of Chittenden," that is to say, the species whose life history he portrays is the *H. litigata* described some ten years ago by the writer, from Florida specimens. In the material from the Department Collections, sent me for examination by Dr. Chittenden, there are many of this species which so far as known to me ranges from the District of Columbia and Ohio to Florida and Texas, and is evidently common or even abundant in this region, and though partial to strawberry, the beetles at least are inclined to be quite polyphagous, especially when swarming. The pin labels on specimens sent by Chittenden indicate the occurrence of the species on rose at Biloxi, Miss.; on *Œnothera biennis*, "reared from egg indoors," Biloxi, Miss.; on crêpe myrtle at Norfolk, Va., and Melbourne, Fla.; on strawberry at Orlando, Fla., Bellemont and Paget, Bermuda, and Tickfaw, La.; on turnip, Bee County, Tex.; on lettuce and on *Gaura sinuata* at Brownsville, Tex.; on Fuchsia at Washington, D. C. There is no mention whatever of larvæ in the departmental notes relative to the above, except in the case of *Gaura sinuata* at Brownsville, where on March 5, 1909, were found "larvæ eating leaves" and eggs also collected. Gaura is nearly related botanically to Œnothera, and both are undoubtedly natural food plants of this insect.

Referring now to the biologic records, pages 74–76 of Bulletin 23, we may say with considerable certainty that in all mentioned cases of injury to strawberries in Florida, North Carolina, Maryland and Indiana, and to Fuchsia at St. Louis, Mo., the culprit was *H. litigata*. The species reported as feeding on grape at Tempe, Ariz. (Insect Life, Vol. I, p. 220) is without much doubt the *H. torquata*. This, under the name *carinata*, is also reported by Coquillet as feeding on grape at Los Angeles, Calif., and one of his specimens is now before me. The Minnesota "lesser grape vine flea-beetle" of Lugger is in all probability the "sixth" Maine species referred to by Woods, pages 150–151, and found by him on two occasions on woodbine. To this species Woods gave a manuscript name and sent me specimens suggesting that I describe it. On a recent visit to the National Museum at Washington, Mr. Schwarz showed me a long series of a new Haltica of which the life history had been worked out and a description written and already submitted for publication by Mr. Iseley of the Department of

Agriculture. I believe this to be the same as Woods' sixth species and Lugger's grape vine species. As for Bruner's Nebraska species and Gillette's Colorado species nothing definite can be said; Chittenden's brief references give no clue and probably the original articles would be insufficient for identification even if they were accessible to me.

The species occurring on laurel, the *kalmiæ* of Melsheimer, I believe as did Horn, notwithstanding the mysterious "plica submarginali," to be the typical *ignita* of Illiger. It is highly improbable that a distinct species of Haltica with a normal submarginal elytral plica, but otherwise agreeing with our laurel species, can exist in the Atlantic region and no specimens of it have turned up in the more than one hundred years since Illiger published his description. In a recent conversation with Mr. Schwarz, he expressed the opinion that this elytral fold was apt to appear fortuitously in any species of Haltica, more especially in the females. Apropos of this observation, there are now before me three examples of a small Haltica (2♂'s 1♀) recently sent me by Chittenden, in the female of which there is a tolerably well defined lateral elytral plica, while the males show slight traces of it. These specimens were collected at West Springfield, N. H., on Lombardy plum. They resemble greatly and probably are the *H. rosæ* of Woods; however, they diverge slightly from my typical examples of *rosæ*, and in the direction of *ignita* (*kalmiæ* Melsh). What I take to be typical examples of the latter differ from typical *rosæ* in their more brilliant color, slightly larger size, more coarsely punctate elytra, and in having the hind margin of the thorax slightly sinuate each side of the middle so as to present a small median lobe. In my typical *rosæ* there is no trace of such a lobe, but this character is probably not entirely constant, nor are either of the others very dependable. In addition to typical *rosæ*, *corni* and *ulmi*, I received from Mr. Woods specimens of another form, of which he wrote as follows: "I have taken another member of the *ignita* group on laurel and am sending specimens under separate cover. I am calling it *kalmiæ* MS. This runs close to *rosæ* in every character, as far as eggs, larvæ and pupæ are concerned." From the above it must be obvious that *rosæ* and *ignita* (*kalmiæ* Melsh = *kalmiæ* Woods MS.) are exceedingly close if actually distinct, and that the Lombardy plum female with the submarginal plica might serve very well for

the type of Illiger's description. It will be of interest to note that laurel was not among the food plants offered the *rosæ* larvæ in Woods' experiments, but that wild plum was offered and refused.

The following additional biologic notes gleaned from the material sent me by Chittenden may well be put on record at this time, but it should be borne in mind that unless otherwise stated it is only the beetles that were found upon the plants, and that in some instances, at least, the visitation probably has no economic significance whatever.

H. bimarginata Say. Intervale, N. H., bred from alder; Gardiner, Me., collected on alder; Brownsville, Tex., feeding on willow; Guadalupe, Cal., on willow. This is the well-known alder flea-beetle; its occurrence on willow is more exceptional.

H. carinata Germ. Mont Alto, Pa., on elm.

H. chalybea Ill. Orlando, Fla., and Warrenton, Va., on grape.

H. evicta Lec. Moscow, Idaho, on strawberry.

H. foliacea Lec. Tecumseh, Okla., "Coll on apple"; Garden city, Kans., "feeding on weeds"; Childress, Tex., "on sugar beets."

H. knabii Blatch. Marshall Hall, Md., reared from larvæ taken in field on *Œnothera biennis*. The specimens bear the label *H. fuscoænea* Melsh, as they probably do in other collections.

H. probata Fall. San Luis Obispo, Calif., "on wild rose."

H. suspecta Fall. Corcoran, Calif., "on sugar beets."

H. vicaria Horn. Fort Collins, Colo., "Sugar beets." I do not think it likely that either of the last two species attack beets in the larval stage or that the beetles will prove a menace to crops.

To the systematist the genus Haltica offers very great difficulties; hence the especial need for the illumination which the complementary work of the biologist may shed upon the obscure relationships of the *ignita* group. While we have as yet no record of the food plant or habits of *H. inærata* Lec. of the Manitoba region, an examination of the type convinces me that it should be restored to specific standing. It should probably be associated with *ignita* and allies, but it differs more from either *ignita*, *rosæ* or *corni* than they do from each other. The ante-basal groove of the thorax, though entire, is less deep than in either of these, the form rather narrower and less broadly shouldered, the color brown bronzed, the elytra typically with a faint greenish reflection which is often lacking. The resemblance of *inærata* to *obolina* of the Pacific

region is more marked than to any of the eastern forms, but the basal impression of the thorax is much stronger than in the latter. I have seen a good series of *inærata* collected at Winnipeg and Husavick, Manitoba (Wallis).

There are yet a considerable number of probably new species in my collection, of which the following four may I think be described at this time in a recognizable manner.

Haltica purpurea sp. nov.

Oval, moderately elongate, dark bronze, the elytra with distinct purple lustre, surface shining. Head and thorax very finely alutaceous, varying to scarcely visibly so; elytra distinctly alutaceous. Antennæ piceous, about $\frac{3}{5}$ as long as the body, 4th joint slightly to scarcely longer than the 3d, fully twice as long as wide; 10th not quite twice as long as wide. Head $\frac{3}{5}$ as wide as the prothorax, eyes only moderately prominent, their width as seen from the front evidently less than half the interocular distance; vertex contiguous to the flattened tubercles smooth, almost without punctures. Prothorax $\frac{2}{3}$ as long as wide, sides narrowly margined, narrowed in front, subparallel in basal half and either with or without a feeble sinuation before the hind angles; punctuation sparse and minute, ante-basal impression fine and sharply defined, but not deep and not quite attaining the sides. Elytra distinctly oval in outline, widest at the middle, not quite $\frac{1}{2}$ wider than the thorax in the male, the female a little stouter; punctuation much more distinct than that of the thorax, but rather fine, the punctures separated on the average by about twice their own diameters, intermixed finer punctures almost entirely lacking. Body beneath and femora piceous, more or less distinctly purpureous; tibiæ and tarsi scarcely metallic. Last ventral of male with the usual apical lobe and smoother median impression. Length, 3.3 to 3.8 mm.; width, 1.8 to 2.1 mm.

Described from a series of 3♂'s, 1♀, taken at Tyngsboro and near Lowell, Mass., by the late Frederick Blanchard, from whom I received them.

An attempt to place this species by Horn's table through a strict interpretation of the characters there used is likely to prove abortive. The oval form of the elytra is quite suggestive of the much larger *californica* and *obliterata*, as well as *cuprascens* Blatch.

and the smaller *fuscoænea*. My suggestion would be that these five species together with *heucheræ* sp. nov., the description of which follows, should be associated in the following order: *obliterata*, *californica*, *cuprascens*, *purpurea*, *heuchræ*, *fuscoænea*. *Purpurea* is probably nearest *cuprascens*, the latter differing in its cupreous coloration, rather larger size and more elongate form, feebler pronotal groove, usually finer elytral punctuation and longer fourth antennal joint, which is three times as long as wide and decidedly longer than the third joint. There are numerous specimens of this species in the Blanchard Collection, now in the Museum of Comparative Zoölogy at Cambridge, Mass. The type is a male labeled "near Lowell, Mass."

Haltica heucheræ sp. nov.

Moderately elongate, head and thorax cupreoæneous, with feeble violaceous lustre, elytra distinctly purpureo-violaceous. Antennae scarcely more than half the length of the body, piceous, joints 2–4 testaceous, several of the following joints more or less rufous basally; joints 3 and 4 subequal, the latter at most only slightly longer, 4th joint twice as long as wide, 10th scarcely more than $\frac{1}{2}$ longer than wide. Head smooth, polished; eyes smaller than usual, feebly prominent, their width as viewed from the front much less than half the interocular distance. Prothorax quadrate, less than $\frac{1}{2}$ wider than long, sides parallel, rather strongly margined, feebly arcuate medially, surface finely alutaceous, and finely rather sparsely punctate; ante-basal groove moderately deep and practically entire. Elytra suboval, humeri narrow and broadly rounded, sides feebly arcuate or (♂ type) straight and parallel for a short distance at middle; surface distinctly alutaceous and rather coarsely punctate, intermixed finer punctures scarcely evident. Body beneath and legs, except tarsi, piceous with purplish surface lustre. Male with the last ventral segment lobed and impressed as usual. Length, 3.5 to 3.8 mm.; width, 1.7 to 1.85 mm.

Described from four examples (type ♂) collected by Mr. Norman Criddle at Aweme, Manitoba "25–IX–1916," on *Heuchera hispida*. The specimens were sent me by Mr. J. B. Wallis, in whose collection are paratypes. The quadrate thorax and oval elytra suggest association with *fuscoænea*, before which this species may be placed as indicated in the remarks following the preceding

description. It is much larger than *fuscoænea*, of different color, with smaller less prominent eyes, more distinctly punctate thorax with deeper ante-basal groove, and entirely dark legs.

Haltica blanchardi sp. nov.

Elongate oblong, green, elytra slightly, thorax rather strongly æneous. Antennæ a little longer than half the body; piceous, with slight metallic lustre; joints 3 and 4 subequal. Eyes prominent, their width as seen from the front nearly equal to half the interocular distance. Head above the frontal tubercles not visibly alutaceous and nearly impunctate. Prothorax $\frac{1}{3}$ wider than long, sides parallel in basal half, convergent in front, subangulate medially, side margin moderate, surface plainly alutaceous, distinctly though finely punctate, basal groove rather wide, vaguely attaining the sides, sharply impressed at bottom, this sharper impression terminating before reaching the margins; hind margin broadly angulate at middle. Elytra oblong, not quite twice as long as wide, sides parallel for $\frac{3}{4}$ their length, surface distinctly alutaceous and rather coarsely and closely punctate with scattered minute punctures intermixed. Body beneath and legs piceous with distinct purple metallic lustre. Length, 3.1 mm.; width, 1.4 mm.

Three examples only of this species are known to me; the type, taken by myself at Tyngsboro, Mass., July 6, 1893, and two other examples in the Blanchard Collection, also taken at Tyngsboro. In size and form it agrees very closely with *amæna* Horn and *vaccinea* Blatch., and with them only. In both these species the color is more decidedly cupreous, and in neither of them is the surface sculpture so marked as in *blanchardi*, which has a finely scabrous aspect. In *amæna*, described from a unique example from Georgia, the elytral punctuation is about as coarse but less dense than in *blanchardi*, the thorax obsoletely punctulate, the basal impression not quite so strong though quite sharply defined. Horn's statement that the antennæ are slightly longer than the body is a manifest inaccuracy, nor should I describe the humeri as oblique. The Floridian species *vaccinea* differs notably from *blanchardi* in its smaller less transverse prothorax, with nearly straight feebly converging sides, and with polished almost imperceptibly punctate surface.

Haltica vialis sp. nov.

Oblong oval, color above and beneath including the legs purpureo-violaceous; sutural region especially toward the base, with greenish reflections. Antennæ dark throughout, feebly metallic, third and fourth joints subequal. Eyes not very prominent, their width viewed from in front less than half the interocular distance. Head smooth posteriorly; vertex, contiguous to the flattened tubercles coarsely punctate from side to side. Prothorax moderately transverse, a little narrower in front, widest behind the middle, sides broadly arcuate, feebly convergent basally, more noticeably so anteriorly; surface scarcely visibly alutaceous, closely comparatively coarsely punctate; ante-basal groove rather feeble, shallow and incomplete. Elytra oblong, slightly oval, sides very broadly arcuate, surface a little more coarsely punctate than the thorax but scarcely as closely so. Body beneath often with greenish reflections. Male with last ventral lobed as usual and with an unusually deep polished median longitudinal impression in posterior half. Length, 4.7 to 5.1 mm.; width, 2.2 to 2.5 mm.

The type is a male and is one of two examples taken by myself at Raton, New Mexico, November 8, 1889. The specimens were taken, if I remember correctly, under shelter of some sort near the railway station while stopping for lunch on my first transcontinental trip to California. I have since similarly taken the species at Seligman, Ariz., and have an example from Flagstaff, Ariz., taken by Dr. Fenyes. There are examples in the Le Conte Collection from Colorado and western Kansas (Popenoe), and in the Horn Collection from Colorado, in both cases placed with the superficially rather similar *torquata*, and both combined with the very different eastern *carinata*, a mix-up that it is certainly difficult to comprehend. Compared with *torquata* the present species is rather larger and more robust, with a much larger thorax and conspicuously coarser punctuation throughout. The ante-basal groove of the thorax is also less sharply defined and the last ventral of the male more deeply impressed.

DESCRIPTIONS OF SOME NEW TROPICAL PACHYGASTRINÆ.

By Charles W. Johnson,
Boston Society of Natural History.

In describing a species of Psephiocera from Jamaica, my attention was called to two apparently new species, representing one Psephiocera and one Chalcidomorphina from British Guiana. The above genera by Dr. Enderlein cover these forms, while a paper by Dr. Kertész enables us positively to determine Cynipimorpha. With the limited material at hand, it is with some misgivings that I offer this paper, but the difficulty of obtaining smaller species from that region is so great that years slip by and they remain undescribed. For instance, the specimens at hand have been in my possession over eighteen years. It is to be hoped that the following bibliography and table of species will aid future workers.

Cynipimorpha bilimeki Brauer. Fig. 1.

C. bilimeki Brauer, Denkschr. der K. Akad., Wien, XLIV, 75, 1882; Kertész, Ann. Mus. Nat. Hung., VI, 343, Tab. 6, Figs. 1, 2, 1908.

In the latter paper Dr. K. Kertész has carefully redescribed Brauer's type and figured the antenna, thus enabling one to readily identify this species which otherwise would have continued to cause confusion among the closely related genera and species. I herewith reproduce the figure given by Kertész. The genus has been emended to *Cynipomorpha* by Enderlein, but the original spelling will have to stand.

Psephiocera Enderlein.

Zoölogischer Anzeiger, 1914, Band 43, p. 300. Type *P. flavipes* Enderlein.

Table of Species.

1. Tomentum forming lines on the disc of the thorax 3
   Tomentum covering the entire thorax 2
2. Scutellum and part of the pleura with light tomentum (Mexico) *minuta* Will.
   Scutellum with black tomentum, pleura shining black without tomentum (S. Brazil) . . . . . *flavipes* Enderl.

3. Thorax with three lines of light tomentum which is also present on the sides, and on the middle of the pleura (Jamaica) *metzi* Johns.

Thorax with a dorsal line of light tomentum, expanding into a large patch in front of the scutellum, also present on sides and on part of pleura (Brit. Guiana) . . . . *dorsata* sp. nov.

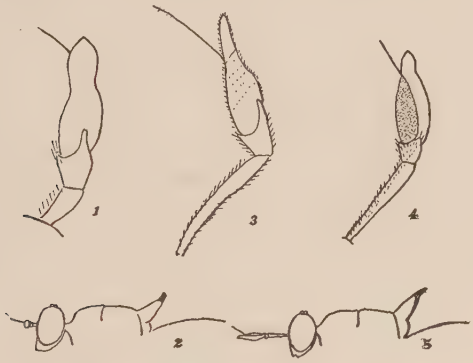


Fig. 1. Antenna of *Cynipimorpha bilimeki* ♂, after Kertész; Fig. 2, scutellum of *Psephiocera minuta;* Fig. 3, antenna of *Chalcidomorphina aurata* ♀, after Enderlein; Fig. 4, antenna of *Chalcidomorphina crewi* ♀, Fig. 5; Scutellum of same.

Psephiocera minuta (Williston). Fig. 2.

Cynipimorpha minuta Williston, Biol. Cent. Amer., Vol. I, p. 252, Tab. 4, Figs. 19, 19a, 1901; Kertész, Ann. Mus. Nat. Hung., Vol. 4, p. 343, 1908.

Psephiocera minuta Enderlein, Zoöl. Anz. Band 43, p. 302, 1914.

Eucynipimorpha minuta Malloch, Ann. Ent. Soc. Amer., Vol. 8, p. 312, 1915.

As pointed out by Dr. K. Kertész this species cannot be placed in the same genus with *Cynipimorpha bilimeki* Brauer on account of the great difference in the antennæ. It was later placed by Dr. Enderlein in the above genus. A specimen in my collection from Mexico agrees with Williston's description except that the femora are yellow with a slight brownish tinge below, and not "except the tips, nearly black." This is evidently a variable character and the specimen probably represents the extreme range of variation in this respect. The third joint of the antennæ under a hand lens (12 diameters) is "finely roughened" but under the binocular with

an enlargement of from 25 to 60 diameters the annuli show distinctly and the roughening is due to rows of minute granules on the annuli; the third joint is yellow with a dark brown spot at the base. In this respect the genus seems to be closely related to Neopachygaster, the glossy brown spot on the antennal joint, which Malloch refers to as "possibly of a sensory nature," is here largely developed. The only other character that seems to separate the two genera is the form of the scutellum. The side view given of *C. minuta* (fig. 19a) shows two small dorsal protuberances at the suture that are not mentioned in the description, nor are they shown in the dorsal view (fig. 19).

Psephiocera metzi Johnson.

Diptera of Jamaica, Amer. Mus. Nat. Hist., Vol. 41, p. 427, 1919.

The apex of the scutellum is slightly shorter and less attenuated in this and the following species, than in *P. minuta* Will.

Psephiocera dorsata sp. nov.

♀ Front black, orbital margins whitish, face white, antennæ yellow, the third joint with five narrow annuli, with a small brown basal spot, arista yellow. Thorax black when viewed from above, the yellowish tomentum forming a dorsal line extending just beyond the suture where it expands into a broad patch in front of the scutellum; there is also an obsolete transverse band in front of the suture; from the humeri large patches of whitish tomentum extend to the base of the wings and across the pleura; base of the scutellum with yellowish tomentum. Abdomen black, looking from behind the fourth segment has three lines of white tomentum, with only the dorsal line showing on the fifth segment, third segment with only a lateral patch when viewed from the side. Legs yellow, femora except at the tips dark brown, front tibiæ also brown, halteres white. Wings hyaline, costa and first longitudinal vein dark brown, stigma yellow, length, 3 mm.

One specimen, Bartica, British Guiana, May 28, 1901 (R. J. Crew). Type in the author's collection.

Chalcidomorphina Enderlein.

Zoologischer Anzeiger, 1914, Band 43, p. 298. Type *C. aurata* Enderlein.

Chalcidomorphina aurata Enderlein. Fig. 3.

Zoologischer Anzeiger, 1914, Band 43, p. 299, figs. 4, 5. Columbia.

The principal character that separates this from the following species is the form of the antennæ. The scutellum of the genotype was missing, but it is probably similar to the following species which is here figured.

Chalcidomorphina crewi sp. nov. Figs. 4, 5.

♀ Face black, whitish pollinose, front black shining, with white orbital spots midway between the vertex and antennæ, from these very narrow orbital lines extend to the face, ocelligerous tubercle prominent, ocelli yellow, antennæ situated about the middle of the head in profile, blackish above and yellow below, first joint slender, about as long as the second and third combined, third joint broadened and somewhat flattened above and minutely flecked with white. Thorax black, with a dorsal line, a narrow transverse band at the suture, and a broad band near the base of the scutellum of yellow tomentum, on the humeri and pleura whitish, scutellum black, the tip longer and more attenuated than in the species of the genus Psephiocera, abdomen black, with a grayish pollinose arcuate band at the posterior margin of the third and anterior margin of the fourth segment, and a V-shaped marking at the end partly on the fourth and partly on the fifth segment. Legs yellow, the anterior femora brownish, halteres white. Wings hyaline with a slight brownish tinge, more noticeable toward the tip, veins brown, stigma yellow, middle portion of the costa and tip of the first vein dark brown, third vein branched. Length, 3 mm.

One specimen collected by Mr. R. J. Crew, at Bartica, British Guiana, July 3, 1901. Type in the author's collection.

NOTES ON THE LINES OF DESCENT OF LOWER WINGED INSECTS.

By G. C. Crampton, Ph.D.,
Massachusetts Agricultural College, Amherst, Mass.

In the February issue of the *Entomological News* for 1919 (Vol. XXX, p. 42) the lines of descent of the Orthoptera and their immediate relatives, were discussed from the standpoint of the comparative morphology of recent forms; but no attempt was made at that time to bring the results into harmony with the conclusions of Handlirsch, 1909 (Die Fossilen Insekten), who has attacked the problem from the standpoint of palæontology. I would, therefore, offer the following brief suggestions as to the location of the lines of descent of certain of the fossil forms described by Handlirsch, in the general scheme of the interrelationships of living insects. It should be borne in mind, however, that since the earlier fossil forms are known almost exclusively from their wing-venation, the position they are assigned in the general scheme is largely conjectural, and must remain so until more of their anatomical details than the few incomplete fragments thus far brought to light are known—for the wing-venation alone (or any other one set of structures) is entirely insufficient evidence upon which to base one's conclusions as to the interrelationships of insects. A good illustration of this point is furnished by the fossil insect *Eugereon*, in which the wings are very conservative (*i. e.*, but slightly modified) while the head has proceeded far along the road to specialization—so much so, in fact, that it would be practically impossible to place *Eugereon* correctly in the general scheme, if it were known only through the venation of its wings. In the recently discovered winged Zoraptera (Proc. Ent. Soc. Washington, Vol. 22, p. 84, and p. 98), on the other hand, the wings are quite highly specialized, while the body structures are quite conservative, and if the detached wings were the only structures known, it is very doubtful if we would be able to place these insects in their correct position next to the line of development of the Isoptera.

As was pointed out in the August, 1919, issue of the Transactions of the Entomological Society of London (p. 93), the Ephemerida, Odonata, and certain Palæodictyoptera form a group characterized by their inability to fold their wings flat along the top of the ab-

domen, and in an article in the May, 1920, issue of the Proceedings of the Entomological Society of Washington (Vol. 22, p. 98) these insects, together with their immediate relatives (*i. e.*, the Protephemerida, Ephemerida, Protodonata, Odonata, certain of the Palæodictyoptera, etc.), were grouped in an ancestral superorder of insects called the Panpalæodictyoptera, or Panplectoptera (from Packard's term "Plectoptera," applied to the Ephemerida). The lines of development of these insects are shown in Fig. 1, although all of the fossil forms are not represented in the diagram.

As is indicated in Fig. 1, the fossil Palæodictyoptera occupy a position at the base of the lines of descent of other winged insects, and have apparently departed as little as any known forms from the first types of winged insects to be evolved. Some of the insects usually included in the order Palæodictyoptera are apparently more closely related to the insects grouped about the Plecoptera, and should be included in the next superorder (Panplecoptera).

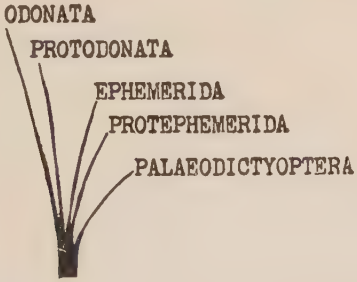


Fig. 1. Lines of descent of the Panplectoptera.

The Ephemerida are in some respects intermediate between the Palæodictyoptera and the Plecoptera (together with certain other forms), and they also exhibit certain archaic features carried over from their Apterygotan forebears—for winged insects were undoubtedly derived from ancestors closely resembling the Lepismidæ and other Apterygota, and could not possibly be derived directly from the Trilobita as Handlirsch would have us believe! The Ephemerida have also retained certain features suggestive of Crustacean affinities, and a study of their anatomy (particularly of the immature stages) is of considerable value in tracing the evolution of the higher forms. Handlirsch considers that the Ephemerida were derived from the fossil Protephemerida, and that the Odonata

were derived from the fossil Protodonata, and the lines of development of these forms were therefore placed close together in the diagram. The Odonata are apparently fairly closely related to the Ephemerida, but their line of development leads away from that of most of the other insects, and they are such highly aberrant forms that a study of their anatomical features is of but little value in attempting to trace the lines of descent of winged insects in general.

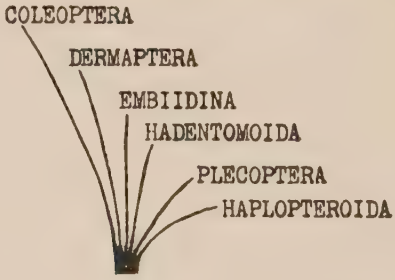


Fig. 2. Lines of descent of the Panplecoptera.

In Fig. 2, the lines of descent of the insects comprising the superorder Panplecoptera (*i. e.*, the Haplopteroida [fossil], Plecoptera, Hadentomoida [fossil] Embiidina, Dermaptera, Hemimeridæ, etc., and possibly including the Coleoptera as well) are shown. If we take into consideration only the Plecoptera, Embiidina, and Dermaptera, the group is characterized in general by a tendency toward the prognathous type of head (*i. e.*, mouthparts directed forward), the presence of three segments in the tarsi, and the absence of styli on the posterior margin of the hypandrium, or sternal plate beneath the genitalia of the male insect. The mesothoracic coxæ are usually as broad, or broader than long in these insects, and there is a marked tendency toward the retention of the longitudinal, rather than the cross veins of the wing in the members of the group.

Handlirsch states that the fossil Haplopteroida are closely related to the Plecoptera and that the fossil Hadentomoida are closely related to the Embiidina, so that the lines of descent of these forms have been represented as though extending rather close together in the diagram. The Haplopteroida are in some respects more specialized than the Plecoptera, and their line of descent

should have possibly been placed above that of the Plecoptera in the diagram.

Of the living forms, the Embiidina are the closest relatives of the Plecoptera, the two lines of development paralleling one another remarkably closely. The Plecoptera are the more primitive of the two, however, and have departed as little as any known living insects, from the condition typical of the ancestors of the other insects of the group—and of the remainder of winged insects as well. The Dermaptera are related to both Embiids and Plecoptera, and are intermediate between these insects and the Isoptera in many anatomical features. The Dermaptera are also extremely like the forms ancestral to the Coleoptera in regard to their maxillæ, antennæ, terga, wing bases, elytra, cerci (compare larvæ of Carabidæ with immature earwigs such as *Dyscritina*, *Karschiella*, etc.), etc., and the members of the superorder Panplecoptera exhibit many other features which must have been present in the ancestors of the Coleoptera (compare head region of *Harpalus* and *Embia*, leg structures etc.). On the other hand, the Neuroptera (and in some respects the Hymenoptera also) are remarkably like the Coleoptera especially with regard to the structural details of the larvæ, so that the Coleoptera could equally well be placed in the superorder Panneuroptera (to which the Neuroptera, Hymenoptera, etc., belong) as in the superorder Panplecoptera, and on this account the Coleoptera have been grouped with the Neuroptera only provisionally, until I am able to find the forms which will enable me to determine definitely whether the closest affinities of the Coleoptera are with the Dermaptera and their allies, or with the Neuroptera and their allies. Anatomically, the Coleoptera are clearly intermediate between the Neuroptera and Dermaptera, and the ancestors of the Coleoptera were apparently intermediate between the Isoptera on the one hand, and the Dermaptera, with their allies, on the other, although the "roots" of the Coleopteron stem strike down deeply toward the Embiid and Plecopterous types of insects.

The Zoraptera, Isoptera, Mantida, Blattida, and the fossil Protoblattida, with their immediate relatives, constitute the superorder Panisoptera, whose members are characterized chiefly by the markedly asymmetrical development of the genitalia of the male insect, although this does not hold true of the Isoptera, in which

the genitalia of the male are not sufficiently well developed to be readily seen. The hypandrium, or sternal plate below the genitalia of the male, frequently bears a pair of styli on its posterior margin, in these insects, and cerci are present in practically all of them. The mesothoracic postscutellum is vestigial in the winged forms of most of these insects (excepting the Zoraptera) and the mesothoracic coxæ are longer than broad in the greater part of the insects constituting this superorder. The lines of descent of these insects are represented in Fig. 3.

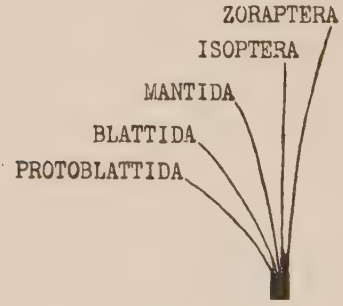


Fig. 3. Lines of descent of the Panisoptera.

Since Handlirsch maintains that the Protoblattida are intermediate between certain of these insects and the Palæodictyoptera, the line of development of the Protoblattida has been represented as the lowest in the diagram (Fig. 3), although not very much is known of the structural details of the Protoblattida, to justify this. The more immediate ancestors of the insects comprising this superorder (Panisoptera) were doubtless very like the Plecoptera and their allies, although the *ultimate* ancestral types of these insects and the Plecopteroid forms as well, are doubtless to be sought among the members of the Palæodictyopteroid group. Indeed, the more the Protoblattida depart from the Blattid and Mantid type, the more closely do they approach the Plecopteroid type, thus indicating that the latter forms resemble the immediate ancestral forms from which the Panisoptera were derived.

The Blattida and Mantida are extremely closely related and their lines of descent have been represented quite close together in the diagram. Taken alone, it would be rather difficult to determine

what living insects are the nearest to the ancestral type from which they were derived; but their near relatives, the Isoptera, are intermediate between the Mantid-Blattid forms and the insects related to the Plecoptera, such as the Dermaptera and Embiidina, and thus serve to connect the two groups. The Isoptera are in some respects more highly specialized than the Blattida; but in other features they are much nearer the ancestral Plecopteroid type, and might, therefore, be considered as in a sense more "primitive" than the Blattida. The Zoraptera are very close to the Isoptera; but have preserved many characters present in the Plecopteroid group. In fact, they are anatomically intermediate between the Isoptera on the one hand, and the Plecoptera (such as *Leuctra*, *Capnia*, etc.) on the other, as was pointed out in a recent article in the Proceedings of the Entomological Society of Washington (Vol. 22, p. 98). They thus serve to connect the Isoptera with the Plecopteroid group, and the Isoptera in turn serve to connect them with the Mantida and Blattida. Furthermore, the Zoraptera are remarkably similar to the ancestors of the Psocidæ, the Thysanoptera, and the Psyllid Homoptera, and are very suggestive of the forms leading to the Hymenoptera and Neuroptera, so that a study of their anatomical details is of the utmost importance in attempting to determine the paths of evolution of the higher forms.

The fossil Protorthoptera, the Grylloblattida, Phasmida, and saltatorial Orthoptera, with their immediate relatives, constitute the superorder Panorthoptera, whose lines of descent are represented in Fig. 4. The ovipositor of the female insect is unusually well developed in many members of this group, and many of them exhibit a tendency toward a thickening of the forewings, which are typically parchment-like in character. The cerci are usually reduced to a single segment (but not in *Grylloblatta*) and there is a tendency toward a reduction of the number of tarsal segments to four or less, in many members of the group. The males of some of these insects have retained a pair of styli on the posterior margin of the hypandrium (ninth sternite), and the genitalia are for the most part of a peculiar, highly modified type (excepting *Grylloblatta*).

Since Handlirsch maintains that the fossil Protorthoptera are very like the ancestors of the insects in question, their line of descent is represented as among the lowest of those shown in Fig. 4. Such forms as *Grylloblatta* and the interesting little Phasmid

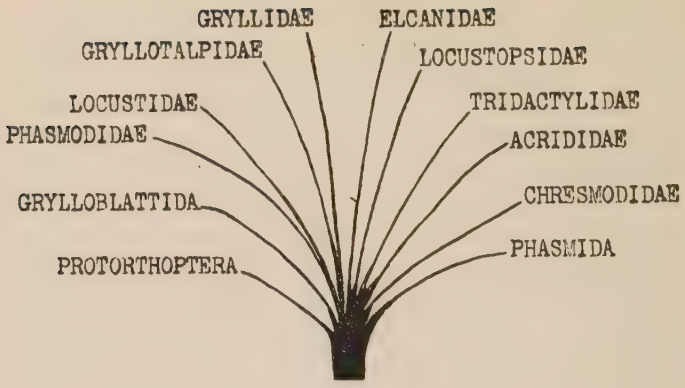


Fig. 4. Lines of descent of the Panorthoptera.

Timema, however, give us a much better idea of the structural details of the lower representatives of the group, since the fossil forms are too poorly preserved for this purpose. *Grylloblatta* is structurally intermediate between the Zorapteron-Isopteron group and the Dermapteron-Embiid group of insects, while *Timema* exhibits more Plecopteroid characters than *Grylloblatta* does. In fact *Timema* exhibits such pronouncedly Plecopteroid features that there can be no doubt that the Plecoptera and their relatives represent the ancestral forms from which such insects as *Timema* (and hence those insects grouped with it) were derived. Of the other Orthopteroid insects, the Gryllidæ and "Locustidæ" (Tettigonidæ) are very like *Grylloblatta*, while the Acrididæ (*i. e.*, true Locustidæ) and Tridactylidæ are nearer the Phasmidæ.

According to Handlirsch, the fossil Chresmodidæ are very closely related to the Phasmidæ, and are intermediate between the Phasmidæ and the fossil Elcanidæ, from which Handlirsch would derive the Tridactylidæ. Handlirsch derives the Acrididæ from the fossil Locustopsidæ, and he considers that the Elcanidæ and Locustopsidæ are somewhat intermediate between the Acrididæ and the Locustid-Gryllid group, so that they have been assigned this position in the diagram shown in Fig. 4—although the diagram in question is somewhat different from that given by Handlirsch to illustrate the interrelationships of the forms in question, especially with regard to the position assigned to the Phasmidæ, which Hand-

lirsch considers as derived forms, rather than as primitive representatives of the types ancestral to the saltatorial Orthopteroids. Handlirsch, however, has reversed the evolutionary sequence in other instances as well, since he would derive the anatomically and embryologically more primitive Dermaptera from Gryllidæ, and the fact that he derives the Hemimeridæ (which are really a suborder of the Dermaptera) as a distinct offshoot of the Gryllidæ, would make it seem probable that he is not very familiar with the anatomy of the insects in question.

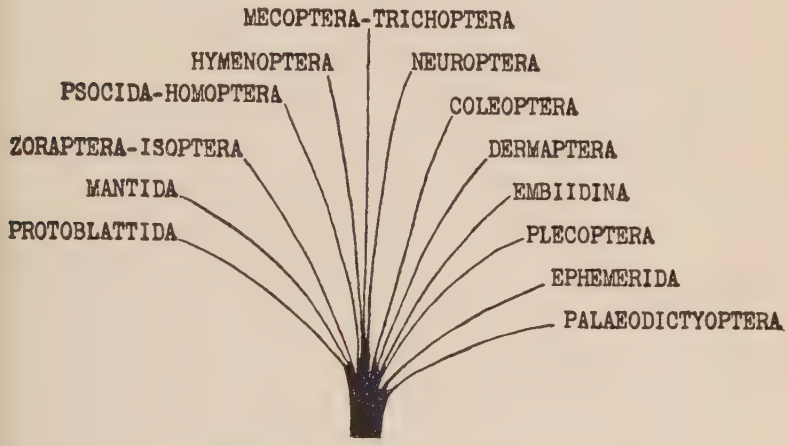


Fig. 5. Lines of descent of higher insects.

In Fig. 5, are shown the interrelationships of the insects occupying a position near the base of the lines of descent of the higher forms. The most important of these are the Zorapteron-Isopteron group, and the Coleoptera with the Dermaptera, since the lines of descent of the Zoraptera, the Hymenoptera and the Neuroptera were derived from ancestors intermediate between these insects, while the Psocidæ, Hymenoptera and Neuroptera are in turn intermediate between these insects and the higher forms such as the Homoptera, Mecoptera, Trichoptera, etc. Thus, the Psocida were evidently derived from ancestors extremely similar to the Zoraptera,[1] while the Psocida are in turn very like the ancestors of the Homoptera (which gave rise to the Hemiptera). The

[1] As has been pointed out in a short paper soon to be published, the wing-veins of the Zoraptera are remarkably similar to those of certain Psocida Thysanoptera and Homoptera.

Hymenoptera occupy a position somewhat intermediate between the Psocida and Neuroptera, but they are also very closely related to the Coleoptera, and it is very probable that their ancestors were anatomically intermediate between the Zoraptera (with the Isoptera) and the Coleoptera (with the Dermaptera). The Mecoptera (and Trichoptera) are quite closely allied to the Hymenoptera on the one hand, and the Neuroptera on the other, although their closest affinities are with the Neuroptera, such Neuroptera as *Nemoptera* being extremely like the forms giving rise to the Mecoptera and to the Diptera, which were derived from Mecoptera-like forebears. The Trichoptera and Lepidoptera, although related to the Mecoptera also, were probably derived from Neuropteroid ancestors closely resembling the Ithoniidæ (such as *Oliarces*). The Neuroptera themselves are extremely closely related to the Coleoptera, and doubtless arose from ancestors intermediate between the Coleoptera (with the Dermaptera and Embiidina) and the Zorapteron-Isopteron group—in other words, the lines of descent of the Psocidæ, Hymenoptera, Neuroptera and other insects at the base of the stem of the higher forms converge to a point intermediate between the Zorapteron-Isopteron group on the one side, and the Coleopteron-Dermapteron group (with the Embiidina) on the other; so that these groups are of the greatest phylogenetic interest, not only from this fact, but also from their position on either side of the stem forms from which the Orthopteroid insects were likewise developed.

With regard to the grouping of the different insect orders into superorders,[1] there are apparently eight principal superorders in the class Insecta. Of these, the superorders Panprotura and Panthysanura belong in the subclass Apterygota, while the other six belong in the subclass Pterygota. The principal representatives of these superorders are as follows:

Proturoid Superorder (Panprotura)
    Protura, Entomobryoida, Sminthuroida, etc.
Thysanuroid Superorder (Panthysanura)
    Campodeoida,[2] Lepismatoida, Machiloida, etc.

[1] If it be advisable to restrict the termination "*ptera*" to groups of ordinal rank, the above-mentioned eight superorders might be termed the Poduriformia, Lepismiformia, Ephemeriformia, Perliformia, Phasmiformia, Blattiformia, Psociformia, and Sialiformia.

[2] A study of the anatomical details of *Campodea*, *Projapyx*, *Japyx*, etc., has shown that these insects belong to a single order, and that the division into Rhabdura and Dicellura is of subordinal value only.

Palæodictyopteroid Superorder (Panpalæodictyoptera)
Protephemerida, Ephemerida, Protodonata, Odonata, Palæodictyoptera, etc.

Plecopteroid Superorder (Panplecoptera)
Haplopteroida, Plecoptera, Hadentomoida, Embiidina, Dermaptera, etc.

Orthopteroid Superorder (Panorthoptera)
Protorthoptera, Grylloblattoida, Phasmoida, Orthoptera, etc.

Isopteroid Superorder (Panisoptera)
Protoblattoida, Blattoida, Mantoida, Isoptera, Zoraptera, etc.

Psocoid Superorder (Panhomoptera)
Psocoida, Mallophaga, Pediculoida, Homoptera, Hemiptera, Thysanoptera (?), etc.

Neuropteroid Superorder (Panneuroptera)
Neuroptera, Hymenoptera, Mecoptera, Protomecoptera, Paramecoptera, Paratrichoptera, Trichoptera, Lepidoptera, Diptera, Siphonaptera, (and possibly Coleoptera and Strepsiptera?).

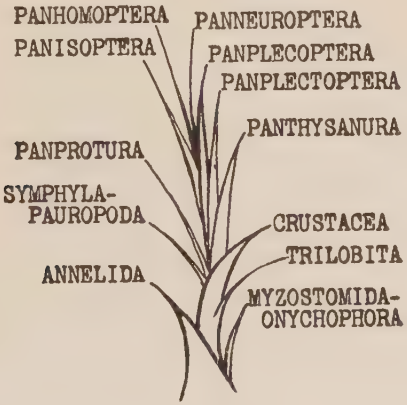


Fig. 6. Grouping of superorders in general scheme.

The interrelationships of these superorders, and their positions in the general scheme, are represented in Fig. 6. As is indicated in the diagram, the Annelida represent as nearly as any known forms, the ancestral types giving rise to the Arthropoda. The Myzostomida-Onychophora group (including the Tardigrada) arose very near the point of origin of the Arthropoda, but these forms are of

less interest than the Annelida themselves (*e. g.*, *Dujardina*, and other Syllidæ) in the study of Arthropodan development.

The Trilobita and such Crustacea as the Apodidæ (together with the Copepoda) are among the most primitive representatives of the Arthopoda, and the Crustacea in particular furnish us with a series of forms from the lowest type to the ancestors of the "Myropoda" and Insecta, and some of them, such as the Isopoda, Tanaidacea, etc., have paralleled the insectan line of development in the most remarkable fashion, the resemblances in many cases extending even to the minutest details, as I am hoping to show in a series of papers dealing with this subject. The "Myriopoda" apparently branched off from the Crustacean stem from ancestors resembling *Bathynella* and other Anomostraca, and the Insectan line of development arose near the same point. Some of the lower Apterygota carried over in their development many features inherited by such "Myriopoda" as the Symphyla and Pauropoda (as is the case with the Protura, Campodeoida, etc.); but many more Crustacean features were inherited by the forms leading up to winged insects, such as *Machilis*, *Lepisma*, etc., and were carried over in the Ephemerida.

As is shown in the diagram (Fig. 6), the members of the Palæodictyopteroid superorder (*i. e.*, the "Panplectoptera") arose from forms resembling the Panthysanura, or Thysanuroid superorder of Apterygotan insects, and are intermediate between the latter and the Panplecopteroid superorder (with the Panisoptera). The higher insects (*i. e.*, the Psocoid and Neuropteroid superorders) in turn, arose from ancestors intermediate between the Panisoptera and Panplecoptera, although the "roots" of these stems strike downward into the Palæodictyopteroid forms also, as is indicated by the carrying over of certain Palæodictyopteroid features in their lines of descent.

The occurrence of annectent forms intermediate between two or more superorders makes it extremely difficult in some cases, to determine exactly where these forms belong. Thus the Coleoptera might be grouped either with the Neuropteroid insects or with the Plecopteroid insects (Dermaptera, etc.), while it is extremely difficult to determine whether to place the Grylloblattoida with the Isopteroid insects, or with the Orthopteroid insects—or even with the Plecopteroid forms. Similarly, the balance of characters in

the Isoptera (with the Zoraptera) and Dermaptera is so evenly divided between the Blattoid and Plecopteroid groups that it is only after careful consideration that one can make up his mind where to place them. On the other hand, such strongly aberrant forms as the Thysanoptera and Strepsiptera are also extremely difficult to place, and until more is known of the embryology, internal anatomy, and further anatomical details of these forms than is at present available as evidence for determining their closest affinities, the groupings here proposed must be regarded as purely provisional, and subject to further revision in the light of subsequent investigation. It may be stated, however, that none of the facts thus far brought forward would indicate that the views here proposed are untenable, and a further study of the forms in question has in each case merely served to confirm the correctness of the conclusions concerning the groupings here proposed.

PROCEEDINGS OF THE CAMBRIDGE ENTOMOLOGICAL CLUB

At the meeting June 8, 1920, Mr. Parker of the U. S. Entomological Laboratory at Arlington, Mass., gave an account of the effect of the hymenopterous egg parasite, *Trichogramma minutum* on the European corn-borer in this country. Last year 28,000 eggs of the corn-borer were examined and 43 per cent. were found parasitized by Trichogramma. Collecting notes were read by several members and notice was given of expected appearance of the periodical Cicada at several localities in Massachusetts, Connecticut and Rhode Island. It was voted to hold the next meeting on the second Tuesday in September.

At the meeting of September 14, 1920, Mr. C. W. Johnson read a paper on the New England brood of the periodical Cicada and its failure to appear this year. Mr. Johnson had visited the place near the Logue reservoir in Washington, R. I., where the insect was found in large numbers in 1903 as described by A. S. Packard in PSYCHE for December of that year, but found none. He read a letter from Mr. George Dimmock who visited the place at Suffield, Conn., where he had collected the Cicada in 1869 and found none at this time. Inquiries were made and letters received from the following places where the insect was seen in 1903 without any

appearance of them this year: Freetown, Mass., near Fall River, Russell, Mass., Tolland, Conn., State Line near Monson, Mass. Mr. Johnson concludes that the brood has become extinct.

Mr. J. H. Emerton spoke of a visit to the summit of Mt. Washington during the first week of July. Two new species of spiders were found under small stones at about 5,000 feet elevation.

Mr. L. W. Swett said that he and Mr. S. E. Cassino had visited Mt. Washington as early as May 28 and again in August and found many rare lepidoptera.

Mr. C. V. Blackburn showed a gynandromorph of the Gypsy Moth with the right side male and left side female, each half with the usual size and colors of its sex.

At the meeting of October 12, 1920, R. Heber Howe, Jr., mentioned the finding of eight species of Dragon-flies new to New England and showed maps giving their known distribution in North America.

Prof. W. M. Wheeler gave an account of his visit last summer to the station of the New York Zoölogical Society 50 miles up the Essequibo River in the forests of British Guiana. One of the great sources of entomological interest was a leguminous tree, Tachigalia, with long pinnate leaves in the hollow petioles of which live great numbers of Coccids, the excretions of which attract swarms of ants and other insects, including a social beetle, and these insects draw around them dipterous and hymenopterous parasites of many kinds. As these trees become larger and their wood harder they become the homes of great colonies of ants.

Dr. Wheeler found one morning a decayed tree filled with a great colony of the ant *Eciton burchelli*. As they were driven out by smoke, clusters of them held together around large cocoons containing male pupæ. The colony finally settled in two large masses in each of which was a freshly matured female. Specimens of the ants were exhibited.

Collecting notes were read and discussed by several members.

Mr. A. F. Burgess, Secretary of the Association of Economic Entomologists, said that enough copies of the Record of Economic Entomology to 1915 had been sold to pay the expense of printing and he was now soliciting subscriptions to a supplementary volume bringing the record up to 1920, the manuscript of which was ready to publish.

BOOK REVIEWS.

THE ORTHOPTERA OF NORTHEASTERN AMERICA, by W. S. Blatchley. The Nature Publishing Co., Indianapolis, Ind., 1920.

In this volume Professor Blatchley has added another to his valuable series of entomological treatises, useful alike to the specialist and the general student of entomology, and one which was much needed, so many scattered descriptions having appeared in recent years at the hands of a number of authors that their collation and correlation by a special student of the order was greatly to be desired. Professor Blatchley's residence in Indiana and Florida and his long familiarity with the group enabled him to bring to the task an equipment possessed by few; and his views on the synonymy, etc., of the various forms should accordingly receive the consideration they deserve, even though it is, perhaps, too soon to decide definitely the standing of some of the less known forms.

The notes on songs, habits and distribution naturally constitute the most attractive part of the book to the biologist, but the bibliography and synonymy are equally helpful to the student.

The volume is well illustrated with text cuts, and well printed except for several instances of inversion of cuts, cases apparently of mistaken humor (?) on the part of the printer's devil (or should it read *vice versa?*). So flagrant are these in character that one might truthfully say that Professor Blatchley owes it to his fellow-scientists, having manuscripts to publish, to acquaint them with the name of the firm responsible for such actions.

The book is a very presentable, readable, and useful account of the order as found in eastern North America, indispensable to every student of the orthoptera, the first of its kind in its field, and we bespeak for it the welcome it deserves.

A. P. M.

EXCHANGE COLUMN.

Notices not to exceed four lines in length concerning exchanges desired of specimens or entomological literature will be inserted free for subscribers, to be run as long as may be deemed advisable by the editors.

Cynipidæ,—galls or the bred makers,—of the world desired for exchange or purchase. Will determine North American material. Address: Alfred C. Kinsey, Bussey Institution, Forest Hills, Mass.

Wanted: Insects of any order from ant nests, with specimens of the host ants, from any part of the world; also Cremastochilinæ of the world. Will give cash or Coleoptera, Hymenoptera and Diptera from the United States.—Wm. M. Mann, U. S. National Museum, Washington, D. C.

Wanted: To exchange, or purchase for cash, specimens of the Genus Apantesis from any locality. Also to purchase rare Catocalæ.—Samuel E. Cassino, Salem, Mass.

Wanted for cash: Lowest representatives of all families of insects, preserved in fluid.—G. C. Crampton, Amherst, Mass.

Wanted: Syrphidæ (Flower-flies) from all parts of the world. Exchanges solicited. Will determine on the usual conditions.—C. L. Metcalf, Ohio State University, Columbus, Ohio.

Largest Expanse—one each ♂ and ♀ Lepidoptera wanted for transfer purposes. Those not good enough for collections will do. Will buy, or exchange for local Lepidoptera, etc.—C. V. Blackburn, 12 Pine St., Stoneham, Mass.

Butterflies of Japan and Formosa, will be exchanged by S. Satake, 48 Aoyama-minamimachi 5-chome, Tokyo, Japan.

For Sale: Psyche, complete set, $40. Volumes 3 to 20, newly bound in 11 volumes, red half calf, with black cloth sides; also Ann. Ent. Soc. Amer., complete, $12. Volumes 1 to 6, newly bound in black half calf, cloth sides.—A. C. Hansen, 945 Margate Ter., Chicago.

For sale, or exchange for entomological items not in my library—American Entomologist, complete; Dyar, List of N. A. Lepidoptera; Redi, Experimenta, circa Generationem Insectorum, 1686; many others.—J. E. Hallinen, Cooperton, Okla.

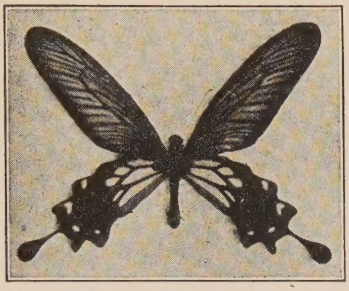
Wanted: To examine, determine and exchange Cicadellidæ or "Jassidæ" from all parts of North America.—J. G. Sanders and D. M. DeLong, State Capitol, Harrisburg, Pa.

Cochineal Insects: Wish to obtain living specimens of cochineal scales. Will purchase or exchange as may be desired.—C. T. Brues, Bussey Institution, Boston 30, Mass.

Wanted: Species of Rhynchophora from Eastern North America not represented in my collection, in exchange for duplicates from Indiana and Florida. Lists of desiderata and duplicates on application.—W. S. Blatchley, 1530 Park Avenue, Indianapolis, Ind.

Ward's Natural Science Establishment

84-102 College Ave., Rochester, N. Y.



Best equipped establishment in the United States for furnishing Entomological Supplies and Specimens

Special Attention is called to our

American Ent. Insect Pins.

Hand made Schmitt and other Insect boxes.

Cabinets and Exhibition Cases of the finest workmanship.

Life Histories of Insects of Economic Importance, in Riker Mounts, Pasteboard and Wooden Exhibition Cases, and Preparations in Alcohol.

Type, Mimicry and Protective coloration collections.

Collections of Household, Garden, Orchard, Forest, and Shade tree pests.

Fine specimens representing Sexual and Seasonal Dimorphism, and warning colors.

Our stock of Exotic Insects is unsurpassed, shipments from our collectors abroad arriving nearly every week.

The following lists are sent free on application:

116. Biological material for dissection.
125. Life histories of economic insects.
128. List of living pupae.
129. Exotic Lepidoptera.
130. North American Lepidoptera.
131. Exotic Coleoptera.
132. North American Coleoptera.
143. Type, Mimicry, etc., collections.
145. List of Pest collections.
147. List of Butterflies for trays and decorative work.
C–30. Catalogue of Entomological supplies.

Amer. Ent. Co. price list of Lepidoptera 80 pages. Price 25c. Free to our customers.

New illustrated catalogue of Insects ready for distribution

Ward's Natural Science Establishment

The Celebrated Original Dust and Pest-Proof

METAL CABINETS

FOR SCHMITT BOXES

These cabinets have a specially constructed groove or trough around the front, lined with a material of our own design, which is adjustable to the pressure of the front cover. The cover, when in place, is made fast by spring wire locks or clasps, causing a constant pressure on the lining in the groove. The cabinets, in addition to being absolutely dust, moth and dermestes proof, are impervious to fire, smoke, water and atmospheric changes. Obviously, these cabinets are far superior to any constructed of non-metallic material.

The interior is made of metal, with upright partition in center. On the sides are metal supports to hold 28 boxes. The regular size is 42½ in. high, 13 in. deep, 18¼ in. wide, inside dimensions; usually enameled green outside. For details of Dr. Skinner's construction of this cabinet, see Entomological News, Vol. XV, page 177.

METAL INSECT BOX has all the essential merits of the cabinet, having a groove, clasps, etc. Bottom inside lined with cork; the outside enameled any color desired. The regular dimensions, outside, are 9 x 13 x 2½ in. deep, but can be furnished any size.

WOOD INSECT BOX.—We do not assert that this wooden box has all the qualities of the metal box, especially in regard to safety from smoke, fire, water and dampness, but the chemically prepared material fastened to the under edge of the lid makes a box, we think, superior to any other wood insect box. The bottom is cork lined. Outside varnished. For catalogue and prices inquire of

BROCK BROS., Harvard Square, Cambridge, Mass.

---

500 PIN-LABELS 40 CENTS! All Alike on a Strip

Smallest Type. Pure White Ledger Paper. Not Over 4 Lines nor 30 Characters (13 to a Line). Additional Characters 1 cent each, per line, per 500. Trimmed.

Prices subject to change without notice.

C. V. BLACKBURN, 12 Pine St., STONEHAM, MASS., U.S.A.

CAMBRIDGE ENTOMOLOGICAL CLUB

A regular meeting of the Club is held on the second Tuesday of each month (July, August and September excepted) at 7.45 P. M. at the Bussey Institution, Forest Hills, Boston. The Bussey Institution is one block from the Forest Hills Station of both the elevated street cars and the N. Y., N. H. & H. R. R. Entomologists visiting Boston are cordially invited to attend.